

SECTION 19

PIERS

1.19.1 TYPES

Subsection 1.5.1 j. of this Manual provides guidance on pier type selections.

1.19.2 WATERWAYS

- a. When a pier is located in a marine environment (Zone 3A or 3B, See Subsection 1.24.18 (e)) reinforcement steel (including footing bars and dowels) shall be zinc-coated (hot-dipped galvanized) or epoxy coated.

The Designer shall designate the use of either galvanized or epoxy coated reinforcement. Consideration must be given to the fact, that in designating galvanized reinforcement, all surrounding reinforcement and miscellaneous hardware, that is to be in touch with the galvanized reinforcement, must be galvanized, plastic or PVC coated.

- b. Steel sheeting below the top of the seal concrete will generally be left in place. If sheeting is left in place it shall be anchored to the top of the seal concrete. Refer to Guide Sheet PLATE 3.13-1 when sheeting is to be left in place. Also, refer to Section 35 of this Manual for guidance on the use of steel sheeting.
- c. Section 46 of this Manual may be referred to for information regarding scour design, scour protection and pier protection methods.

1.19.3 RAILROADS

- a. Railroad companies usually require steel sheet piling for excavations adjacent to railroad tracks. The NJDOT Utility and Railroad Engineering Unit should be contacted for specific information regarding these requirements. This information should be obtained prior to the submission of Preliminary Bridge Plans.
- b. Piers, that support bridges over railroads and that are located less than 7.6 meters from the centerline of track, shall either be of solid shaft construction or shall be protected by a reinforced concrete crash wall that extends not less than 2.1 meters above the top of rail. This will provide an allowance of 300 millimeters for future ballasting of the railroad tracks and for potential encroachment during construction or maintenance operations.

The crash wall shall be at least 1.1 meters thick and shall connect with all the columns. The face of the crash wall shall extend a distance of at least 150 millimeters beyond the face of the columns on the side adjacent to the track and

it shall be anchored to the columns and footings with adequate steel reinforcement.

For more information, reference Chapter 8, Part 2, Section 2.1.5 of the A.R.E.A. Manual For Railway Engineering.

- c. Footing designs within the theoretical railroad embankment line shall provide a 2.5 meters minimum distance from any point on the rail to the side of the steel sheet piling used for support of tracks during construction.

1.19.4 ANCHOR BOLTS

The NJDOT Standard Specifications for Road and Bridge Construction do not permit drilling holes for anchor bolts in rigid frame and T-type piers. The following steps shall be taken to insure proper construction clearances for anchor bolts (Also see Guide Sheet PLATE 3.5-4).

- a. Design drawings shall show (in a detail plan and a cross-section view) the relationships between the anchor bolts and the layers of reinforcement steel immediately under each bearing pad. Detail dimensions shall be given, locating the centers of the anchor bolts and reinforcement bars.
- b. Reinforcement bars adjacent to anchor bolts shall be so spaced as to allow the free installation of 75 millimeters diameter sleeves for setting anchor bolts.
- c. Necessary detail sketches shall be shown to a scale of not less than 1:20. The vertical rows and the horizontal layers of reinforcement steel shall be so spaced as to allow a minimum of 2 diameters clear space between bars to facilitate placing of the concrete.

1.19.5 ROUND COLUMNS

- a. Spirals shall be used for reinforcement for pier columns. Generally, for the typical grade crossing, 914 millimeters round columns will be used with 16 millimeter x 85 millimeters pitch bar for spiral reinforcement. The spiral reinforcing shall be full height of column plus extend into the pier cap and the footing by a minimum of 450 millimeters and shall end with 1.5 turns at each end.
- b. Guide Plate 3.5-2 provides reinforcement detailing for round columns. Refer to 1.19.2 above for guidance concerning the use of epoxy coated and galvanized reinforcement.

1.19.6 PILE BENTS

- a. For pile bent type piers, the designer shall establish the minimum pile tip elevation. This elevation shall be shown on the plans.

- b. If the structure is located in a severe salt intrusion zone or a salt splash zone, (Zone 3A or 3B as illustrated in the Chart entitled "Zonal Areas of New Jersey Affected by Salinity" in Subsection 1.24.18 of this Manual), all spiral reinforcement for cast-in-place, precast or prestressed concrete pile bents shall be epoxy coated or zinc-coated (hot-dipped galvanized).

The concrete clear cover for all substructure units that are located in a severe salt intrusion zone or salt splash zone shall be a minimum of 65 mm.

Refer to 1.19.2 above for guidance concerning the use of epoxy coated and galvanized reinforcement.

- c. Pile bents located in a severe salt intrusion zone or a salt splash zone, as described above, may be constructed with the use of a corrosion inhibitor admixture. The Designer shall investigate this allowance, including costs, and shall advise the Manager, Bureau of Structural Engineering of the potential benefit.

Subsection 501.12, Subpart 19 of the NJDOT Standard Specifications for Road and Bridge Construction may be referenced in the use of a corrosion inhibitor admixture.